Installation/User Manual

APsystems ECU-3
Energy Communication Unit (ECU)

Version 4.2 7/15

APsystems
600 Ericksen Ave. NE Ste 200
Seattle, WA 98110
TEL: 844-666-7035 EMAIL: info@APsystems.com
WEB: www.APsystems.com

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INTRODUCTION

The APsystems Communicator, our state-of-the-art Energy Communication Unit (ECU), is the information gateway for our microinverters. The unit collects module performance data from each individual microinverter and transfers this information to an Internet database in real time, requiring only a single data and power cable. Through the APsystems Monitor software, the APsystems Communicator gives you precise analysis of each microinverter and module in your solar installation from any web-connected device. The APsystems Communicator's integrated http webserver offers the simplest and most flexible network integration of any data logger on the market. The user-friendly browser-based interface lets you access your solar array in seconds.

Features

- Collects individual module and microinverter statistics
- Communicates in real time
- Requires no additional wiring

The APsystems Microinverter is used in utility-interactive grid-tied applications, and is made up of three key elements:

- APsystems Microinverter
- APsystems Energy Communication Unit (ECU)
- APsystems Energy Monitor and Analysis (EMA) web-based monitoring and analysis system

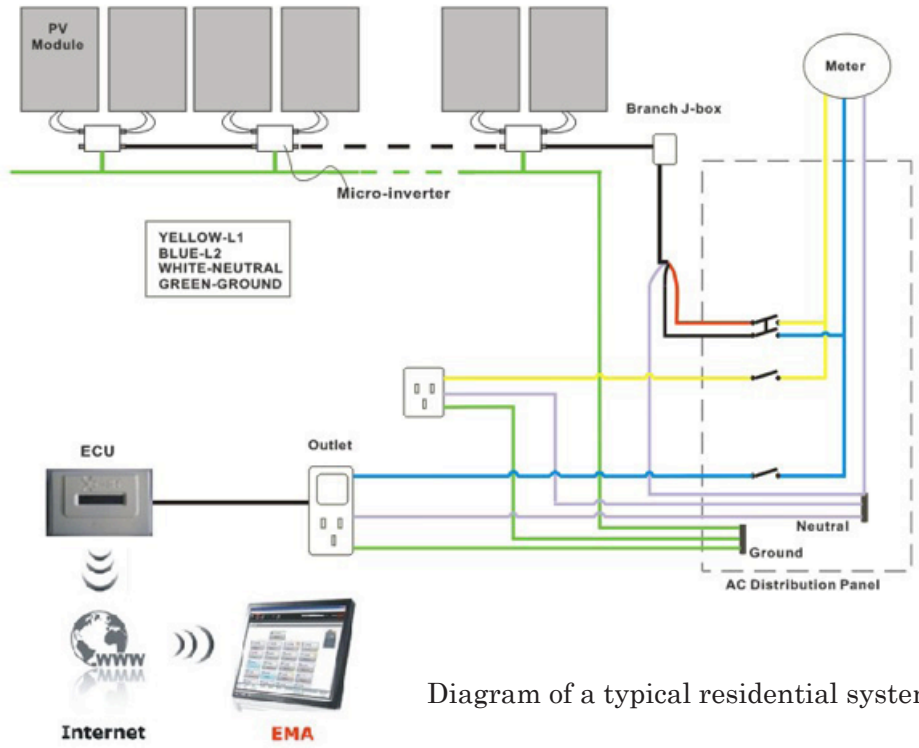


Figure 1

Diagram of a typical residential system

HARDWARE INSTALLATION

Preparation

Make sure you have the following things taken care of before attempting to install the ECU:

- A dedicated standard AC electrical outlet (located electrically as close to the array as is possible).
- A broadband Internet connection is available for your use.
- A broadband router with either a CAT5 Ethernet, or wireless router is available for your use.
- A laptop with a web browser (to view the APsystems EMA online monitoring application).
- A pre-programmed ECU (see pg. 20).

Selecting an Installation Location for the ECU

- A location that is electrically as close to the array as is possible – preferably a dedicated outlet installed directly to the solar system sub-panel.
- The ECU is NOT rated for outdoor use, so if installing outdoors near a junction box or breaker panel, making sure that you enclose it in an appropriate weather proof NEMA electrical box.

Using Electrical Mounting Din Rail

1. Loosen the two (2) M3 mounting screws on the back of the ECU and rotate the two (2) rail holders so that the holders are above the ECU.

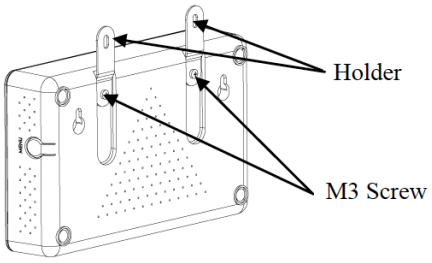


Figure 2

2. Attach the ECU to the mounting rail with machine screws.

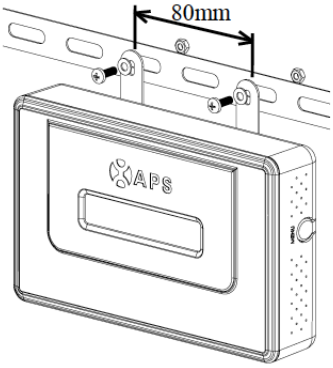


Figure 3

Using Wall Mount

When mounting the ECU to a wall, make sure to select a cool, dry, indoor location.

1. Depending on the wall surface you are mounting the ECU to, use either two (2) #8 drywall screws or wall anchors, installed 130 mm apart. The drywall screws and wall anchors are NOT included in the ECU kit.
2. Align and slide the ECU onto the mounting screws.

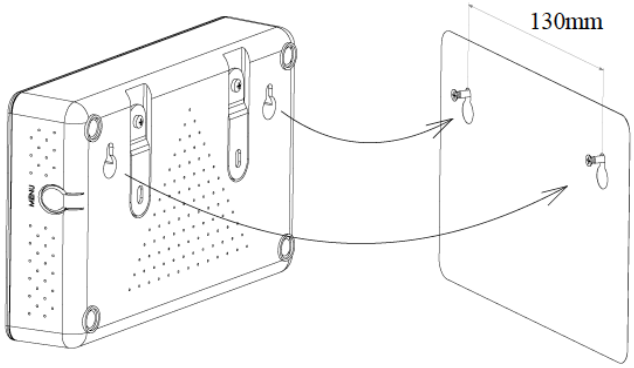


Figure 4

<u>Best Practice:</u> Install and connect the ECU to the Internet (see below instructions) while the rest of the array is being installed. Doing so allows the ECU to automatically update its internal software while the rest of the physical installation is underway. The ECU will then communicate with the inverters when the installation is complete and the array is energized.

Cable Connections

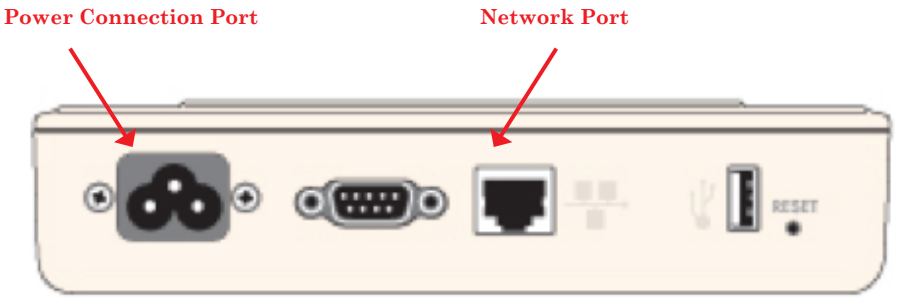


Figure 5

1. Connect the supplied power cable to the power connection port on the bottom of the ECU.
2. Connect the supplied CAT5 cable to the network port on the bottom of the ECU.

Internet Connection

There are two different approaches to connecting the ECU to the Internet:

- Direct CAT5 network connection to a broadband router.
- Wireless connection to a wireless broadband router.

NOTE: The ECU is NOT a wireless device and requires a wifi extender or bridge to make the connection to a wireless router.

Direct CAT5 Connection

1. Make sure the CAT5 cable is connected to the network port on the bottom of the ECU.
2. Connect the CAT5 cable into a spare port on the broadband router.

Figure 6

Wireless Connection

Using a wifi extender:

1. Make sure the CAT5 cable is connected to the network port on the bottom of the ECU.
2. Connect the CAT5 cable into the wifi extender.

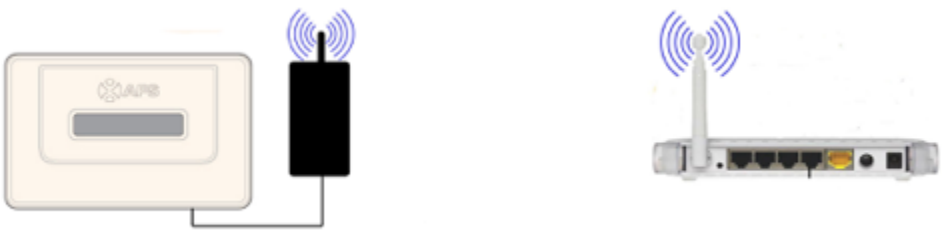


Figure 7

Using a PLC bridge:

NOTE: A PLC bridge uses the power line to communicate and requires both a "send" and "receive" unit.

1. Make sure the CAT5 cable is connected to the network port on the bottom of the ECU.
2. Connect the CAT5 cable into the "send" unit of the PLC bridge.
3. Connect a CAT5 cable from the "receive" unit of the PLC bridge into a spare port on the broadband router (refer to bridge users manual for specific operating instructions).

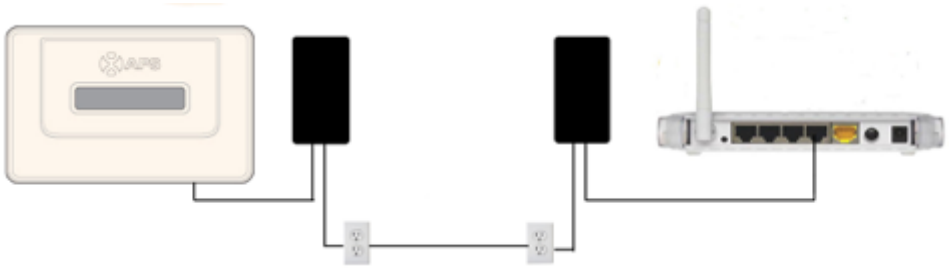


Figure 8

Power Up ECU

1. Make sure the power cable is correctly connected to the power connection port on the bottom of the ECU.
2. Plug the power cable into a dedicated standard AC electrical outlet.

WARNING: Make sure to use a dedicated outlet for the ECU. Do NOT plug any other devices into the same outlet as the ECU.

WARNING: Do NOT plug the ECU into a power strip, surge protector, or uninterruptable power supply (UPS). The surge suppression and/or filtering on these sorts of devices will substantially diminish PLC performance.

ECU INITIALIZATION SEQUENCE

Once power is supplied to the ECU it automatically steps through a series of initialization screens on its LED display.

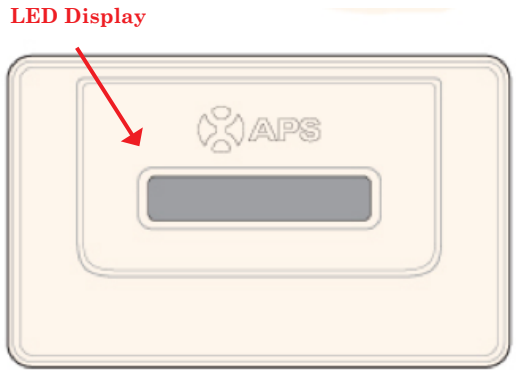


Figure 9

ECU Initialization

1. Loading the software firmware.

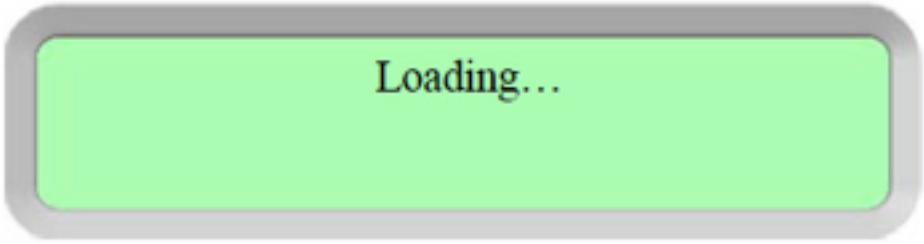


Figure 10

2. Searching for the inverters.

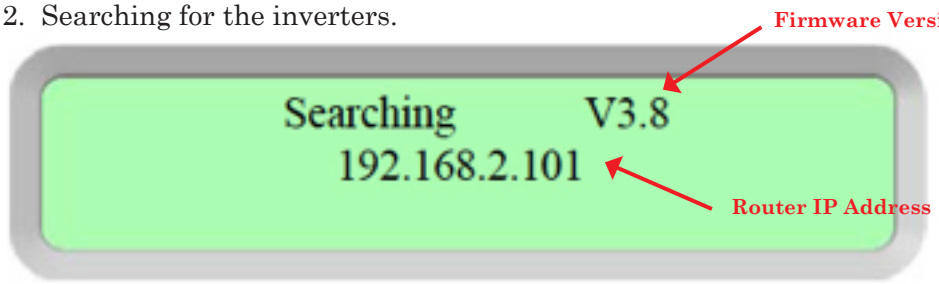


Figure 11

A word about network communication protocols. The ECU needs to have access to the router via an IP address. The ECU will only search for and obtain a DHCP IP address during its powering up sequence.

For example, the LED screen on the front of the ECU displays an IP address such as “192.168.2.101” if the connection to the router is successful (the IP address will vary based on router supplier, so check with the user manual for specifics). If, however, the LED displays “60.190.131.228”, the ECU-router connection has not been successful, in which case you’ll need to check all of the cabling connections and reboot the ECU by removing the power cable for a few seconds and reconnecting.

ECU INITIALIZATION SEQUENCE

NOTE: The complete initialization sequence can take several minutes (up to 15 minutes depending on the complexity of the installation).

3. Operating Interface.

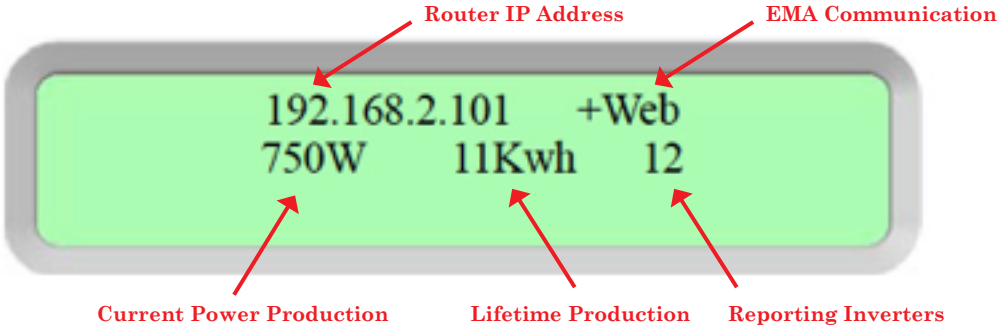


Figure 12

Router IP Address: The LED screen on the front of the ECU displays an IP address such as "192.168.2.101" if the connection to the router is successful (the IP address will vary based on router supplier, so check with the user manual for specifics). If, however, the LED displays "60.190.131.228", the ECU-router connection has not been successful, in which case you'll need to check all of the cabling connections and reboot the ECU by removing the power cable for a few seconds and reconnecting.

EMA Communication: A "+Web" indicates that the ECU is communicating with the APsystems EMA via the Internet. "-Web" is an indication that there is a problem and the ECU is not communicating with the APsystems EMA.

Current Power Production: What the solar array is producing currently (in Watts).

Lifetime Production: The lifetime power output of the system (in kWh).

Reporting Inverters: The number of inverters reporting into the ECU. If the number is followed by an "!", then the number of reporting inverters does not match the number of UIDs that have been programmed into the ECU (see Managing Inverter UIDs pg. 20).

NOTE: The inverter UIDs must be programmed into the ECU for the ECU to recognize the inverters. The ECU will NOT auto-sense the inverters (see Managing Inverter UIDs pg. 20).

USING THE ECU MENU BUTTON

You can access the ECU's menu by pressing and holding the Menu Button on the side of the ECU for 2 seconds.

NOTE: The Menu Button will only cycle through its menu selections once the ECU has been successfully initialized.

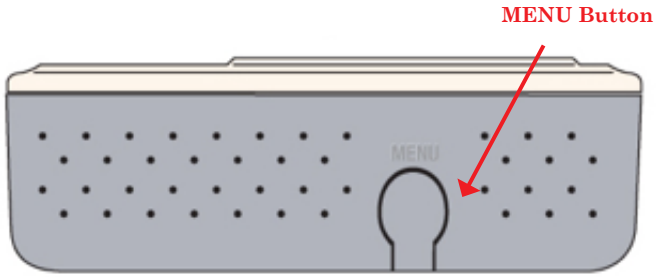


Figure 13

The ECU has the following menu structure (displayed on LED screen):

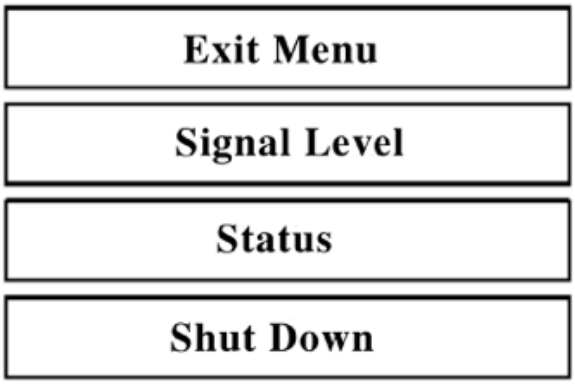


Figure 14

Press and hold the MENU Button, releasing the button to gain access to the functionality of each menu item.

Exit Menu: Returns the ECU to the normal operating screen (see Operating Interface Pg. 9).

Signal Level: The PLC signal strength measured from 1-5, with higher number being stronger signal strength.

NOTE: Signal Level will not be displayed if there is no PLC.

The Signal Level screen.

Figure 15

Status: Reports both the number of inverters that should be reporting into the ECU (Total), and the number that are actually reporting (Connected). These numbers should match.

The Status screen.

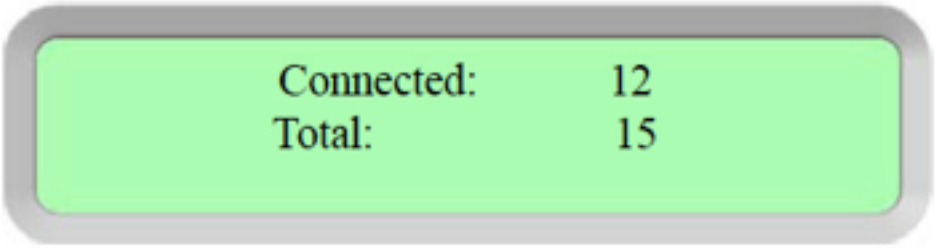


Figure 16

Shutdown: Shuts down the entire system.

The Shutdown screen.

Figure 17

NOTE: Leaving the MENU Button untouched for one (1) minute returns the ECU to the normal operating screen (see Operating Interface Pg. 9).

LOCAL NETWORK INTERFACE

The ECU can be configured, and its data reviewed, by connecting a computer to the ECU via the Local Area Network (LAN), or by connecting directly to the ECU via its Ethernet port.

Connecting to the ECU via the LAN

1. Make sure both your computer and the ECU are correctly connected by the LAN.
2. Using a standard web browser on your computer, enter the IP Address that is displayed on your ECU in to the URL search field.

The ECU's "splash" screen is displayed.

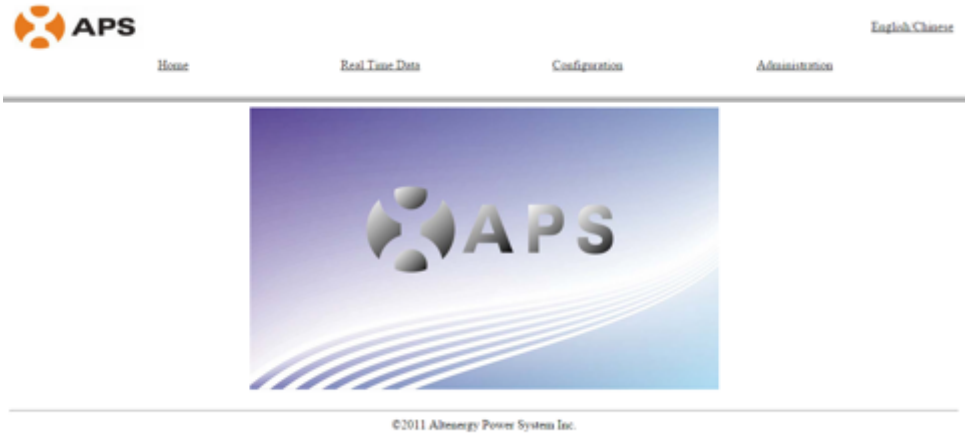


Figure 18

Connecting Directly to the ECU

Using a Windows-based PC

1. Connect the computer to the ECU using a CAT5 network cable.
2. Power up the ECU by connecting the power cable.
3. Open the "*Network and Sharing Center*" in the Control Panel on the PC.
4. Select "*Local Area Connection*" for "*Unidentified Network*".
5. Select "*Properties*" when "Local Area Connection Status" (LAC) window is displayed.
6. Highlight "*Internet Protocol Version 4 (TCP/IPv4)*" when the "*Local Area Connection Properties*" window is displayed.
7. Select "*Use the Following IP Address*" radial button and the enter IP Address and Subnet Mask as listed below. Do not enter anything in the DNS Server address section.
    - IP Address: 60.190.131.190
    - Subnet Mask: 255.0.0.0
8. Select "OK" on the IPv4 Properties window.
9. Close the LAC Properties window.
10. Close the LAC Status window.
11. Close the Network and Sharing Center.
12. Using a standard web browser on your computer, enter the IP Address that is displayed on your ECU in to the URL search field.

The ECU's "splash" screen is displayed.

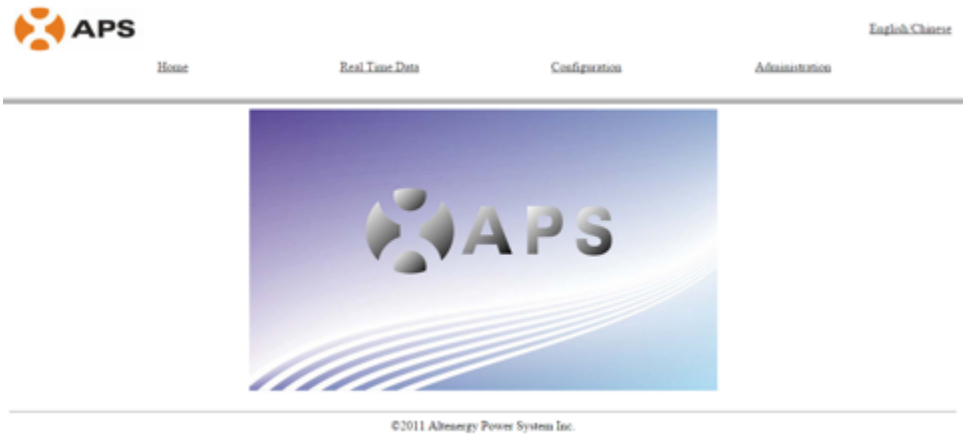


Figure 19

Using an Apple Mac

1. Connect the computer to the ECU using a CAT5 network cable.
2. Power up the ECU by connecting the power cable.
3. Select the Apple icon in the menu bar to access "*System Preferences*".
4. Select "*Network*" in the "Internet & Wireless" section of the System Preferences.
5. Select "*Ethernet*" on the left side of the Network window.
6. Select "*Manually*" from the "*Configure IPv4*" drop down menu.
7. Enter the following in the appropriate fields:
    - IP Address: 60.190.131.190
    - Subnet Mask: 255.0.0.0
8. Leave the "*Router*" field blank.
9. Select "*Apply*".
10. Using a standard web browser on your computer, enter the IP Address that is displayed on your ECU in to the URL search field.

The ECU's "splash" screen is displayed.

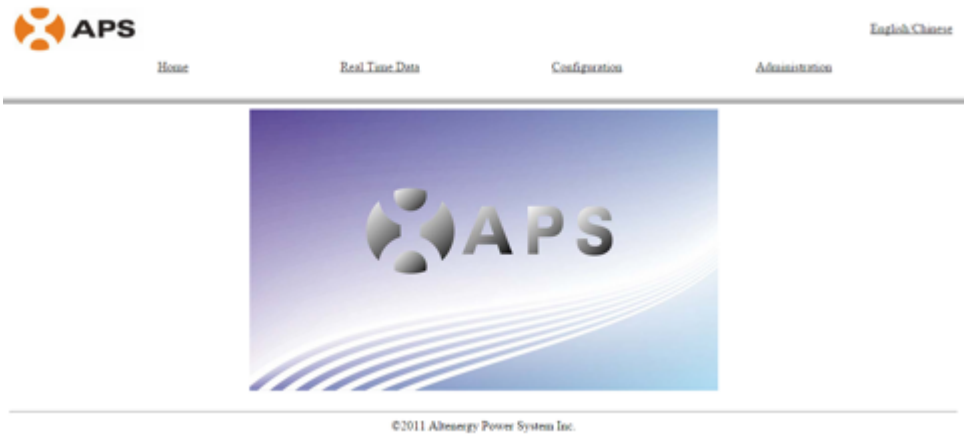


Figure 20

Viewing the ECU's Home Page

1. Select "Home" at the top of the page.

The Home Page is displayed.

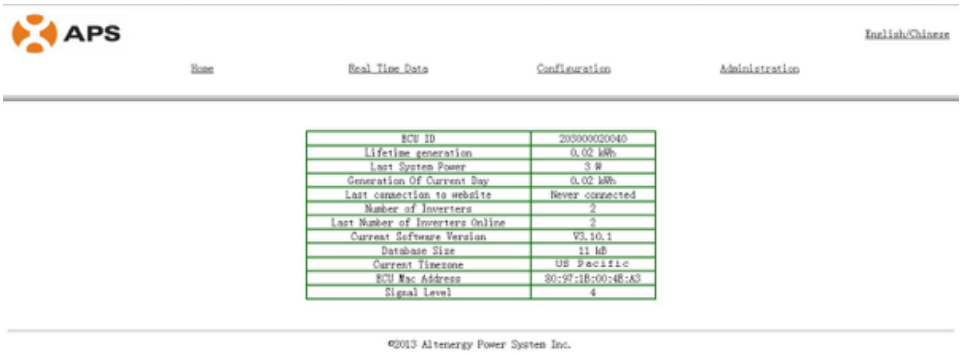


Figure 21

ECU ID: This is a unique number that identifies this specific ECU.

Lifetime Generation: Amount of power this system has generated during its lifetime.

Last System Power: Amount of power the system was generating during its last polling cycle.

Generation of Current Day: Amount of power that has been generated during the most current day.

Last connection to Website: The last time the ECU checked into the central APsystems EMA database.

Number of Inverters: Number of inverters that have programmed into the ECU.

Last Number of Inverters Online: Number of inverters that are checking in with the ECU.

Current Software Version: Version of software firmware.

Database Size: Amount of data currently being stored on the ECU.

Current Timezone: Time zone that has been programmed into the ECU.

ECU Mac Address: The computer "machine address" of the ECU.

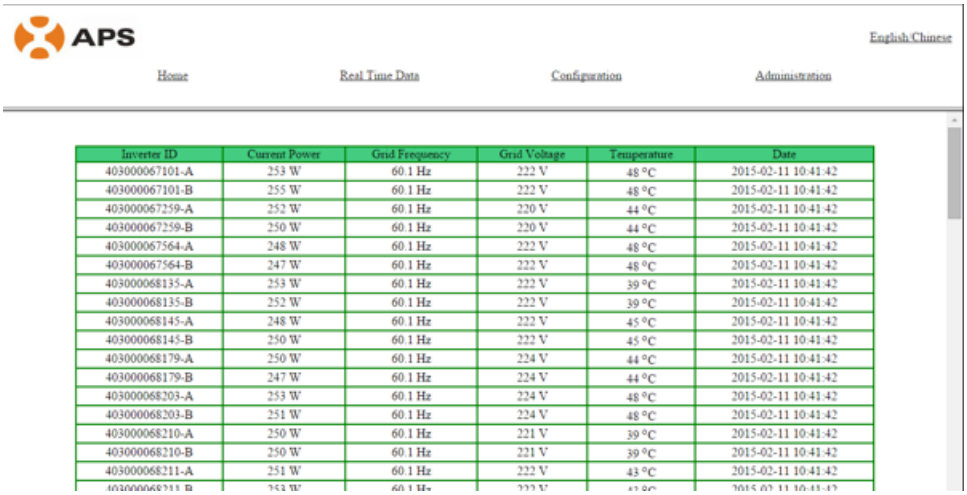
Signal Level: The PLC signal strength measured from 1-5, with higher number being stronger signal strength.

NOTE: Signal Level will not be displayed if there is no PLC.

Viewing the Real Time Data

1. Select "Real Time Data" at the top of page.

The Real Time Data screen is displayed.



Inverter ID	Current Power	Grid Frequency	Grid Voltage	Temperature	Date
403000067101-A	253 W	60.1 Hz	222 V	48 °C	2015-02-11 10:41:42
403000067101-B	255 W	60.1 Hz	222 V	48 °C	2015-02-11 10:41:42
403000067259-A	252 W	60.1 Hz	220 V	44 °C	2015-02-11 10:41:42
403000067259-B	250 W	60.1 Hz	220 V	44 °C	2015-02-11 10:41:42
403000067564-A	248 W	60.1 Hz	222 V	48 °C	2015-02-11 10:41:42
403000067564-B	247 W	60.1 Hz	222 V	48 °C	2015-02-11 10:41:42
403000068135-A	253 W	60.1 Hz	222 V	39 °C	2015-02-11 10:41:42
403000068135-B	252 W	60.1 Hz	222 V	39 °C	2015-02-11 10:41:42
403000068145-A	248 W	60.1 Hz	222 V	45 °C	2015-02-11 10:41:42
403000068145-B	250 W	60.1 Hz	222 V	45 °C	2015-02-11 10:41:42
403000068179-A	250 W	60.1 Hz	224 V	44 °C	2015-02-11 10:41:42
403000068179-B	247 W	60.1 Hz	224 V	44 °C	2015-02-11 10:41:42
403000068203-A	253 W	60.1 Hz	224 V	48 °C	2015-02-11 10:41:42
403000068203-B	251 W	60.1 Hz	224 V	48 °C	2015-02-11 10:41:42
403000068210-A	250 W	60.1 Hz	221 V	39 °C	2015-02-11 10:41:42
403000068210-B	250 W	60.1 Hz	221 V	39 °C	2015-02-11 10:41:42
403000068211-A	251 W	60.1 Hz	222 V	43 °C	2015-02-11 10:41:42

Figure 22

Managing System Parameters

The inverters are pre-programmed with system parameters with factory setting, but these parameters can be changed based on local grid and utility requirements.

WARNING: Only certified APsystems Installation Technicians should be managing the system parameters. Resetting these parameters incorrectly can severely affect system performance. Contact APsystems Technical Support (APsystems Technical Support at 844-666-7034 or support@APsystems.com) BEFORE attempting to change the system parameters.

1. Select "*Configuration*" at the top of page.
2. Select "*Parameters*".

The Parameters screen is displayed.

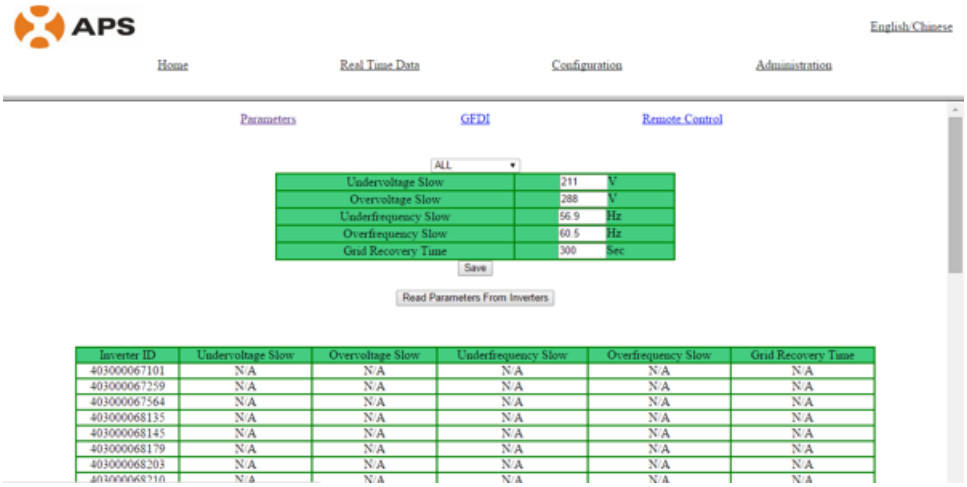


Figure 23

3. Make the parameter changes that are required.
4. Press "*Save*".

It will take a few minutes for the inverter parameter changes to be reflected in the list of inverters.

Clearing GFDI Faults

1. Select "*Configuration*" at the top of page.
2. Select "*GFDI*".

The GFDI page is displayed.

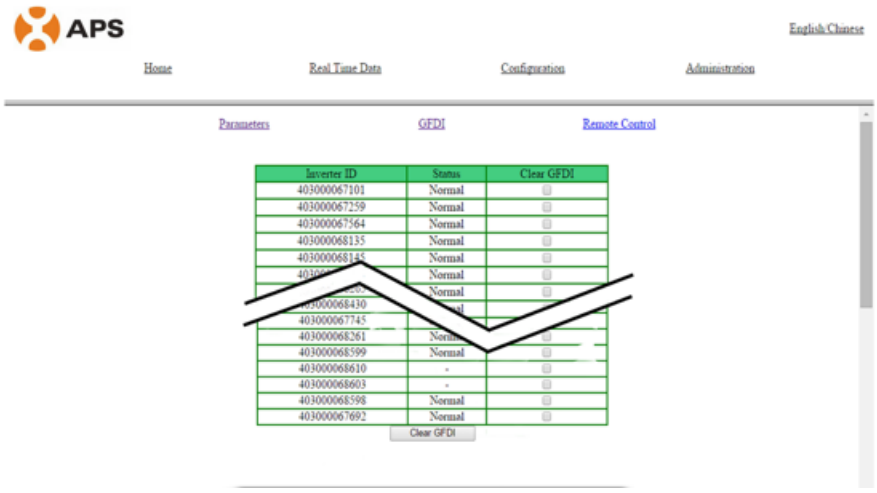


Figure 24

3. Place a check mark in the "Clear GFDI" column for those inverters that need to have GFDI cleared.
4. Press "Clear GFDI" button at the bottom of the page.

Turning ON and OFF Inverters

Individual, or all of the inverters can be turned ON and OFF through the ECU.

1. Select "*Configuration*" at the top of page.
2. Select "*Remote Control*".

The Remote Control page is displayed.

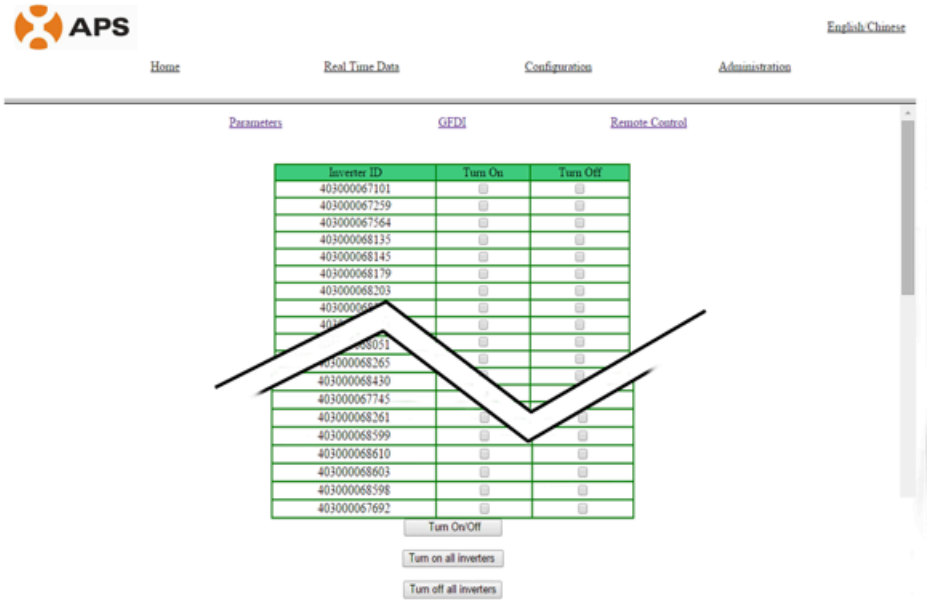


Figure 25

If selecting individual inverters –

3. Place a check mark in either "*Turn On*" or "*Turn Off*" column for those inverters that need to be turned on or off.
4. Press "*Turn On/Off*" at the bottom of the page.

If turning all of the inverters On or Off –

3. Press either the "*Turn on all inverters*" or Turn off all inverters" buttons at the bottom of the page.

Managing Inverter UIDs

The inverter UIDs must be programmed into the ECU for the ECU to recognize the inverters. The ECU will NOT auto-sense the inverters.

Initial Programming of the ECU with the Inverter UIDs

1. Select “Administration” at the top of the page.
2. Select “ID Management”.

The UID Management page is displayed.

NOTE: The “Enter Inverter ID” window field will be blank if you have not yet entered any of the inverter UIDs.

Figure 26

3. Enter each 12-digit inverter UID, followed by pressing the “Enter/ Return” key (providing a line break between each entry).
4. Once all the UID have been entered, press “*OK*”.

Adding Additional Inverter UIDs

1. Select "*Administration*" at the top of the page.
2. Select "*ID Management*".

The UID Management page with the existing inverter UIDs is displayed.

Figure 27

3. Scroll down to the end of the existing list.
4. Enter the new UID.
5. Press "*OK*".

Deleting an Existing Inverter UID

1. Select "*Administration*" at the top of the page.
2. Select "*ID Management*".

The UID Management page with the existing inverter UIDs is displayed.

3. Highlight the UIDs to be deleted from the list.
4. Press "*OK*".

NOTE: Pressing "*Clear ID*" deletes ALL of the inverter UIDs from the list.

NOTE: Combine the above two (2) steps when swapping out an inverter. Add the new inverter, and Delete the old one. Remember to follow up with the same process on the APsystems EMA because the ECU and EMA need to be in synch with each other.

Changing the Date, Time Zone

It is critical for accurate power production reporting that the ECU is programmed with the correct date, time, and time zone.

1. Select "*Administration*" at the top of the page.
2. Select "*Date, Time, Timezone*".

The Date, Time, Time Zone page is displayed.

Figure 28

3. Enter the correct date in the "Date" field.
4. Enter the correct time in the "Time" field.
5. Select the correct time zone from the Time Zone pull down.

NOTE: You can skip steps 3 and 4 by select the correct time zone. Selecting the correct time zone automatically updates both the date and current time.

Managing the Network Connection

The default network connection setting for the ECU is "DHCP" which allows the ECU to automatically establish a connection assignment from the router. The ECU can be assigned a static IP Address if the network design requires it.

Assigning a Static IP Address to the ECU

1. Select "*Administration*" at the top of the page.
2. Select "*Network Connectivity*".

The Network Connectivity page is displayed.

Figure 29

3. Enter the "*IP Address*", "*Netmask*", "*Gateway IP*", "*Primary DNS Server*", and "*Secondary DNS Server*" (Refer to you local network administrator for these settings).
4. Press "*Update*".

REMOTE ECU MANAGEMENT

The ECU has been design with remote connect functionality. You can access this remote functionality through the APsystems Energy Monitoring & Analysis [EMA] website, using your installer login credentials. Changes made remotely through the EMA do not take affect until the ECU's next reporting cycle.

The ECU must first be installed with verified Power Line Communication [PLC] and Internet connectivity.

The ECU remote functionality allows you to do the following:

- Set Time Zones
- Manage Inverter UIDs

There are additional ECU functions available but the instructions are not outlined in this document. If you need to access one of the following features, please contact APsystems Technical Support at 844-666-7034 or support@APsystems.com.

- Change system parameters
- Turn the inverters ON and OFF
- Reset GFDI
- Reset Power Settings

NOTE: This section of the documentation assumes you have a working knowledge of the APsystems EMA.

1. Log onto your APsystems EMA account.

Your Customer List within the Installer Portal is displayed.

2. Select the customer's ECU you want to manage and click on the pencil icon in the "Change ECU Status column.

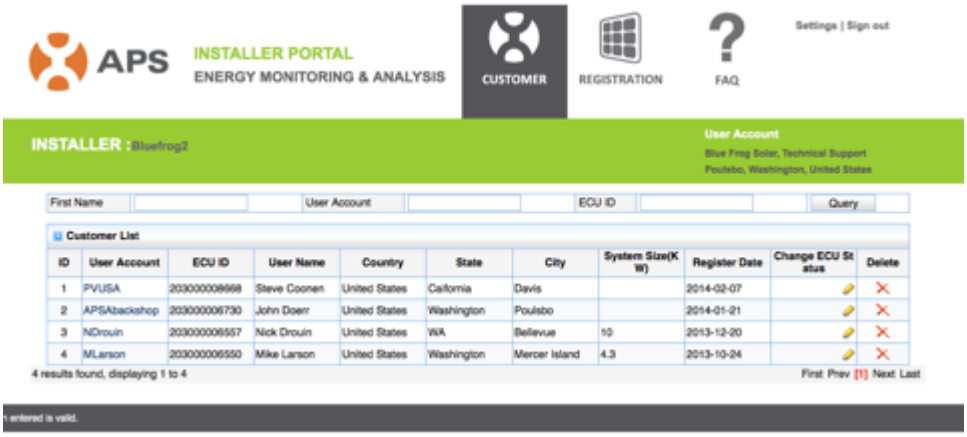


Figure 30

ECU Configuration/ECU Status Page

The ECU SETTING page is your entry point into managing ECUs remotely.

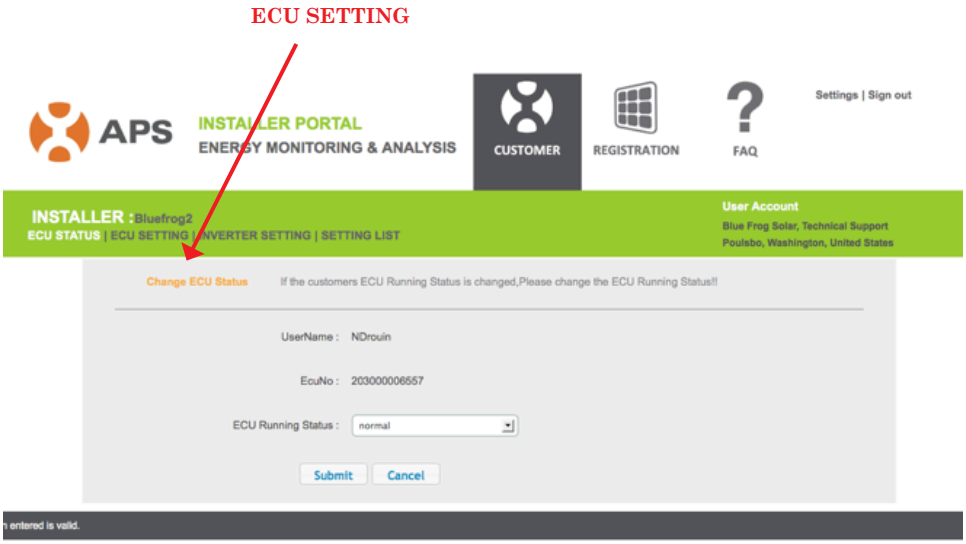


Figure 31

The ECU SETTING tab allows you to:

Set Time Zones

- The ECU time zone can set or adjusted remotely through the ECU Setting tab. If the time zone is not properly set the solar production data will not post properly on the EMA site.

Load Inverter UIDs

- Once the ECU has been installed you can access the ECU remotely to add the inverter UIDs. Until the inverter UIDs are loaded, the ECU will not be able to collect data from the inverters.

Update Inverter UID list

- If an inverter(s) is added or swapped for a new unit, then the ECU's programmed list of inverters will need to be updated.

Setting the ECU Time Zone

1. Select the "*ECU SETTING*" tab.

The ECU Configuration page is displayed.

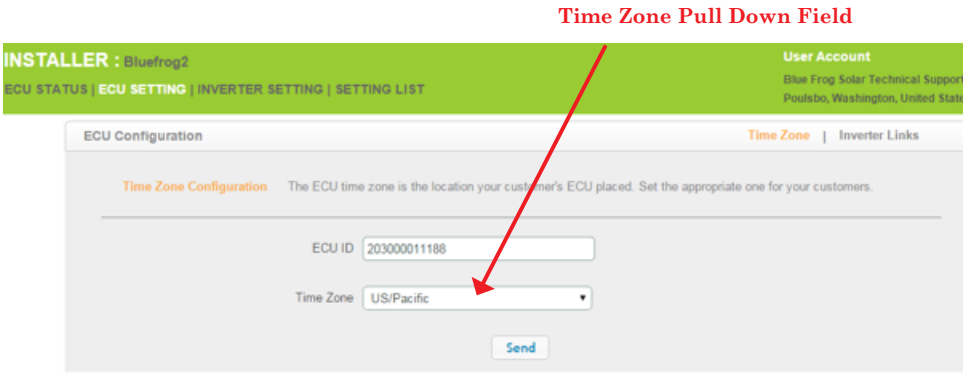

Time Zone Pull Down Field
INSTALLER : Bluefrog2
ECU STATUS | ECU SETTING | INVERTER SETTING | SETTING LIST
User Account
Blue Frog Solar Technical Support
Poulsbo, Washington, United State
ECU Configuration
Time Zone | Inverter Links
Time Zone Configuration
The ECU time zone is the location your customer's ECU placed. Set the appropriate one for your customers.
ECU ID
203000011188
Time Zone
US/Pacific
Send

Figure 32

2. Using the "*Time Zone*" pull down field, select the appropriate time zone.
3. Press "*Send*".

Managing Inverter UIDs and Updating the Inverter UID List

1. Select the "*ECU SETTING*" tab.

The ECU Configuration page is displayed.

2. Select the "*Inverter Links*" tab.

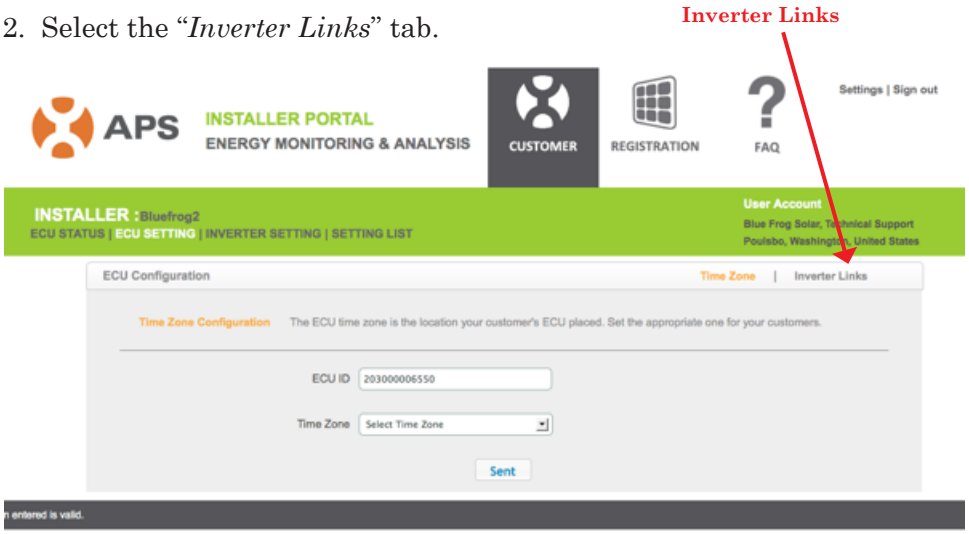


Figure 33

The Inverter Links Configuration page is displayed.

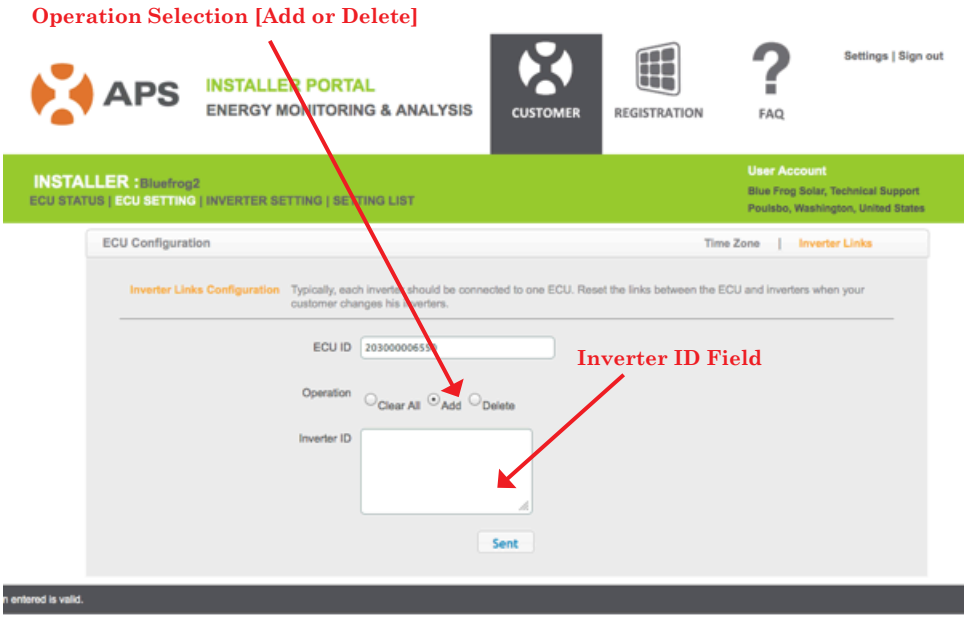


Figure 34

Adding Complete List of Inverter UIDs for a Newly Installed System

1. Select "*Add*" in Operation Selection.
2. Enter all of the inverter UIDs into the Inverter ID Field (one per line).
3. Press "*Send*".

Delete UIDs from Inverter List

1. Select "*Delete*" in Operation Selection.
2. Enter all of the inverters to be removed from the Inverter ID Field.
3. Press "*Send*".

TECHNICAL DATA

Model: ECU-3	
Communication Interface	
Power Line	APS Proprietary
Ethernet	10/100M Auto-sensing, Auto-negotiation
USB interface	Standard
RS232	Standard
Power Requirements	
AC Outlet	110~240 VAC, 50~60 Hz
Power Consumption	2.5 W
Mechanical Data	
Dimensions(W×H×D)	182 mm×113 mm×42 mm
Weight	380 g
Ambient Temperature Range	-40°C to +65°C
Cooling	Nature Convection; No Fans
Enclosure Environmental Rating	Indoor - NEMA 1(IP30)
Features	
Standard Warranty Term	3 Years
Compliance	IEC 60950-1, EN60950-1, IEC 60529, EN 60529, ANSI/UL 60950-1, CAN/CSA C22.2 No.60950-1, UL50E, FCC part 15, EN61000-6-1, EN61000-6-3, ICES-003, AS NZS 60950-1, GB/T17799

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. This Class B digital apparatus complies with Canadian ICES-003.